

U.S. Patent Application Serial No. **10/530,475**  
Amendment filed December 20, 2007  
Reply to OA dated August 31, 2007

### **REMARKS**

Claims 1-3 and 5-17 are pending in this application. Claims 1-3, 5-14 and 16 are canceled without prejudice or disclaimer, claims 15 and 17 are amended and claims 18-21 are newly added herein. Upon entry of this amendment, claims 15 and 17-21 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is as follows:

Claim 15 has been amended to incorporate the limitations of its base claim. In addition, the particles are limited to be titanium oxide particles, as supported by original claim 5, and claim 15 is amended to limit the mean diameter of the atomized droplets to about 1  $\mu\text{m}$  to about 25  $\mu\text{m}$ , as supported by original claim 9. Claim 15 is also amended to limit the heating temperature to about 130 °C to 180 °C, as supported by the specification at page 11, lines 25 and 26 and original claim 10.

Support for new claims 18-21 may be found in original claims 6 to 8 and 11, respectively.

**Claims 1, 5-9 and 12-14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Akui et al. (U.S. Patent Application Publication 2002/0042343). (Office action paragraph no. 3)**

**Claims 2 and 3 are rejected under 35 U.S.C. §103(a) as being unpatentable over Akui et al. (U.S. Patent Application Publication 2002/0042343) as applied to claims 1, 5-9 and 12-14**

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**above, and further in view of Arakawa et al. (U.S. Patent No. 6,228,796)** (Office action paragraph no. 4)

**Claims 15-17 are rejected under 35 U.S.C. §103(a) as being unpatentable over Muramatsu et al. (U.S. Patent Application Publication 2002/0002112) in view of Akui et al. (U.S. Patent Application Publication 2002/0042343)** (Office action paragraph no. 6)

Reconsideration of the rejection is respectfully requested in view of the amendments to the claims. As noted above, claim 15 has been amended to incorporate limitations of claims 1, 5, 9 and 10, as well as a limitation on heating temperature to about 130 °C to 180 °C. Amended claim 17 and new claims 18-21 are all dependent from claim 15.

The present invention achieves the remarkable effect of providing a photoelectrode for dye-sensitized solar cells with excellent performance, by forming a porous titanium oxide film with photocatalytic activities on an electrically conductive transparent layer formed on a transparent high polymer film substrate (the specification, page 20, line 35, to page 21, line 4).

The present invention also achieves the effects (1) to (4) discussed on pages 9-10 of the Amendment dated June 27, 2007. In addition, with regard to claim 21, by microwave sintering the semiconductor particle dispersion liquid applied to a high polymer film substrate such as a polyethylene terephthalate, a porous film can be formed in which the semiconductor particles are uniformly sintered, even when the film has a large area.

These effects are achieved in the production of the photoelectrode, because of the fact that the photoelectrode of the present invention is prepared by applying a titanium oxide particle

dispersion liquid to the electrically conductive layer on the film substrate by spray coating in such a manner that the atomized droplets of the dispersion liquid have a mean diameter of about 1  $\mu\text{m}$  to about 25  $\mu\text{m}$ .

The coating compositions used in Akui et al. '343 and Maramatsu et al. '112 comprise an aqueous peroxotitanic acid solution or titanium oxide precursor sol solution, together with polyethylene glycol. Thus, unless the applied composition is heated at a temperature of 200°C or higher, the polyethylene glycol does not evaporate, failing to obtain a favorable porous film (please see Akui et al. '343, paragraph [0049]; and Maramatsu et al. '112, paragraphs [0085] and [0087]). Accordingly, in Akui et al. '343 and Maramatsu et al. '112, the substrate is substantially limited to glass, and it is impossible to form a porous titanium oxide film on a thermoplastic substrate, such as a high polymer film or the like.

Neither Akui et al. '343 nor Maramatsu et al. '112 teaches or suggests the mean diameter of atomized droplets of the coating composition during spray coating. Therefore, the methods of Akui et al. '343 and Maramatsu et al. '112 can achieve none of the above-described effects in the production of a photoelectrode, which can be accomplished by the present invention.

Applicant therefore submits that claims 15 and 17-21, as amended, are not obvious over Akui et al. '343, Arakawa et al. '796, and Maramatsu et al. '112, taken separately or in combination.


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If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicant's undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosures: RCE Transmittal  
Petition for Extension of Time

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